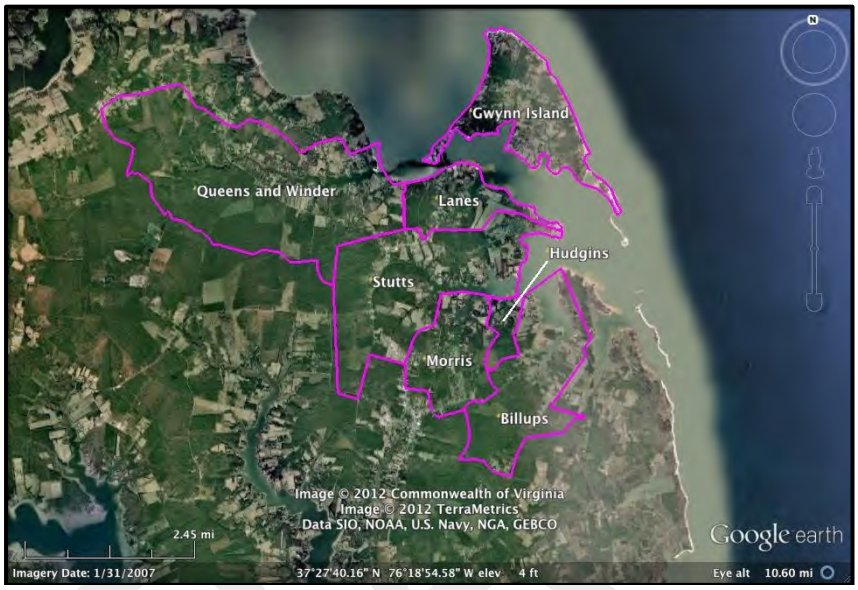
Water Quality Implementation Plan for Gwynns Island, Milford Haven and Piankatank River Watersheds (Upper and Lower)

(Shellfish Areas Listed Due to Bacterial Contamination)



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This booklet is an abbreviated version of the technical report, which can be obtained by contacting the Virginia Department of Conservation and Recreation (DCR). Agency contact information can be found on the back of this booklet.

EXECUTIVE SUMMARY

This document includes a restoration plan for sixteen watersheds located in portions of Mathews, Middlesex and Gloucester counties. Of those sixteen watersheds, ten were listed as impaired for fecal coliform bacteria in shellfish supporting waters in Virginia's 1998 303(d) List and were included in Total Maximum Daily Load studies completed from 2005-2009.. The other six watersheds have been condemned for shellfish harvesting by the Virginia Department of Health (VDH) but are not included in a TMDL study. They were added to this plan due to their close proximity to ten impairments listed in three separate TMDL studies. All of the creeks do not support Virginia's bacteria standards for the production of edible and marketable shellfish. The applicable fecal coliform bacteria standard specifies that the 90th percentile fecal coliform value for a sampling station not exceed an MPN (most probable number) of 49 per 100 milliliters. For every impaired water body on the 303(d) List, the Clean Water Act and the U.S. Environmental Protection Agency (EPA) both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant (40 CFR Part 130). TMDLs establish the reduction in loads needed to restore these waters. The Virginia Water Quality Monitoring, Information and Restoration Act (WQMIRA) directs the State Water Control Board (SWCB) to "develop and implement a plan to achieve fully supporting status for impaired waters."

The **Gwynns Island and Milford Haven** watersheds, included in the Department of Environmental Quality (DEQ) November 2007 TMDL study, are located within Mathews County. The five condemned areas in the watershed are **Edwards Creek, Queens Creek, Stutts Creek, Morris Creek** and **Billups Creek**.The watershed occupies a landscape position at the mouth of the Piankatank River in the south eastern corner and lies between the Chesapeake Bay and the Piankatank River. In addition, **Lanes, Hudgins and Barns Creeks** were added to this plan due to their condemnations since the development of the TMDL and due to their close proximity to those watersheds covered in the TMDL study.

The **Upper Piankatank River** watershed, included in the DEQ December 2005 TMDL study, is located within Middlesex and Gloucester Counties. The two condemned areas in the watershed are portions of the **Upper Piankatank River** and **Harper Creek**. The watershed occupies a landscape position along the upper third of the Middle Peninsula which is bounded on the north by the Rappahannock River, on the east by the Chesapeake Bay and on the south by the York River. The watershed is bounded on the west by state route 360 in Essex and King William Counties which may be considered the headwaters of the system, the head of the tidal portion begins at state route 17. The tidal watershed is bounded on the north by state routes 17 and 33, and on the east by the lower Piankatank River watershed, which can be considered to begin just east of the community of Piankatank Shores, and the Chesapeake Bay. Also included were condemned shellfish waters in **Frenchs, Ferry, and Dancing Creeks**.

The **Lower Piankatank River** watershed, included in the DEQ February 2005 TMDL study, is located within Middlesex and Mathews Counties. The three condemned areas in the watershed are portions of **Wilton Creek**, portions of **Healy Creek** and **Cobbs Creek**. The watershed occupies a landscape position along the northern and southern shores west of the confluence of the Piankatank River and Chesapeake Bay. The watershed is bounded on the west by state route 3, rural routes 625, 626 and 628 and state route 33 to the north and northwest, state route 198 to the south and rural route 633 and Stove Point to the east, including Hartfield, Wilton and Cobbs Creek communities.

Virginia law requires that a plan be developed to achieve fully supporting status for impaired waters. There is close geographic proximity between Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks - six creeks also impaired for the shellfishing use - to the waterbodies that have completed TMDLs. As a result, these six creeks were included in the Implementation Plan process as it is expected that similarities and proximity amongst these waterways with those streams having completed TMDLs imply similar bacteria reduction goals.

Marina on Cobbs Creek

Review of TMDL Development

DEQ used a simplified tidal volumetric model along with bacterial source tracking to aid in identifying sources (i.e., human, livestock, pet and wildlife) of fecal contamination in the development of the TMDLs. The TMDLs for the Gwynns Island and Milford Haven, Upper Piankatank and Lower Piankatank watersheds are based on the 30-sample 90th percentile concentration, which was determined to represent the critical condition. Since the source assessments were redone for these creeks, either the new load reduction or the one in the TMDL, whichever was most stringent, was selected as shown in Table 1.

Table 1: Bacteria Load Reductions by Watershed

Gwynns Island/Milford Haven Watersheds		Upper Piankatank Watersheds		Lower Piankatank Watersheds	
	% reduction		% reduction		% reduction
Queens	95	Upper Piankatank	99	Wilton	84
Stutts	97			Healy	96
Morris	98	Harper	79	Cobbs	96
Hudgins	93	Frenchs	97		
Billups	97	Ferry	94		

Lanes	93	Dancing	89		
Edwards	99				
Barn	79				

Public Participation

Public meetings were held to inform the public regarding the end goals and status of the IP process as well as to provide a means for soliciting participation in the smaller, more targeted meetings (*i.e.*, working groups). Working groups were assembled from communities of people with common concerns regarding the IP process and were the primary arena for seeking public input. The working groups formed were Residential/Recreational, Business (Agriculture, Watermen, Marinas) and Government. Representatives from each working group participated on the Steering Committee, where input from the working groups was reviewed and decisions about the IP were made. Throughout the public participation process, major emphasis was placed on discussing best management practices (BMPs), BMP specifications and efficiencies, locations and quantity of control measures (BMPs), education programs, technical assistance, and funding.

Most members of the working groups agreed that a cornerstone of the implementation plan is cultivating public involvement and education. As well, encouraging commitment and partnerships between the citizens in the watershed and government agencies in order to reduce fecal bacteria pollution is vital to the plan's success. Some members stressed that voluntary approaches would be successful in most of the areas but that regulatory measures may be necessary for reducing loadings of some sources. Overall, some key members in the community and agency contacts were very helpful with refinement of local information and the likelihood of success for various best management practices. There are excellent opportunities in each county for strong and varied partnerships to ensure follow-through on the clean-up plan objectives.

Assessment of Implementation Action Needs

Field surveys in the watershed and analysis of aerial imagery were used along with the stakeholder workgroups and the TMDL study to conduct a bacteria source reassessment and evaluate alternative BMPs and strategies to reduce the bacteria loads reaching the creeks. Due to the inclusion of watersheds without TMDLs, the watershed boundaries were also reassessed during this process. The various practices were discussed by the workgroups regarding the costs, effectiveness, and appropriateness for the specific characteristics of the watersheds. Overall, the implementation needs for the five-year Phase 1 implementation period were identified and are shown in Table 2a., 2b., and 2c.

Cost estimates of the agricultural, residential, and other BMPs in this plan were calculated by multiplying the unit cost by the number of BMP units in each watershed. The unit cost estimates for the agricultural BMPs were derived from the Department of Conservation and Recreation's Agricultural Cost-Share Database. Average costs for BMP installations in Mathews, Middlesex and Gloucester County were used where sufficient data existed, otherwise Middle Peninsula average costs were used. The unit costs for residential practices were developed through discussions with the local health departments, the Middle Peninsula Planning District Commission, the Virginia Institute of Marine Science, the IP workgroups and estimates from previous implementation plans. Estimates for education programs were based on target audience size and experiences in other plans. Total Phase 1 (years 1-5) implementation cost estimates are as follows:
Gwynns Island/Milford Haven watersheds = $ 2,084,600
Upper Piankatank watersheds = $2,227,150
Lower Piankatank watersheds = $836,300

Additional Phase 2 (years 6-10) implementation could be considered in order to fully implement TMDL load allocations. Phase 2 cost estimates are as follows:
Gwynns Island/Milford Haven watersheds = $397,150
Upper Piankatank watersheds=$482,600
Lower Piankatank watersheds=$177,750

Table 2a. BMPs needed for Gwynns Island and Milford Haven watersheds – Edwards, Barn, Queens, Stutts, Morris, Billups, Lanes, Hudgins Creeks

Agricultural BMPs			
Phase 1	Phase 2	**Units**	**Practice**
41		Systems	Livestock Exclusion (LE-1T, SL-6AT)
130		Acres	Vegetated Buffer on Cropland
Residential BMPs			
Phase 1	Phase 2	**Units**	**Practice**
1082	1082	System	Septic Tank Pump Out (RB-1)
3		System	Septic Connection to Public Sewer
35		System	Septic System Repair (RB-3)
33		System	Septic System Installation/Replacement (RB-4)
5		System	Septic System Installation/Replacement with Pump (RB-4P)
26		System	Alternative On Site Septic System (RB-5)
160		Acres	Vegetated Buffers on Residential Land
108	25	System	Pet Waste Composter
Education Programs			
Phase 1	Phase 2	**Units**	**Practice**
2	1	Program	Recreational Boater Education Program
3	3	Program	Residential Education Program (pet, septic, horse)
1	1	Program	Watermen Education Program
3	3	Program	Aquaculture (Oyster Gardening) Education Program
3	3	Program	Wildlife Education/Management Program
Other BMPs			
Phase 1	Phase 2	**Units**	**Practice**
20	38	System	Public Pet Waste Collection Facility/Signage/Supplies
7		System	Confined Canine Waste Control System
3		System	Marina Boat Waste Discharge Facilities

Table 2b. BMPs needed for Upper Piankatank watersheds – Upper Piankatank River and Harper, Frenchs, Ferry and Dancing Creeks

Agricultural BMPs			
Phase 1	Phase 2	**Units**	**Practice**
41		Systems	Livestock Exclusion (LE-1T, SL-6AT)
60		Acres	Vegetated Buffer on Cropland
Residential BMPs			
Phase 1	Phase 2	**Units**	**Practice**
1455	1455	System	Septic Tank Pump Out (RB-1)
NA	NA	System	Septic Connection to Public Sewer
51		System	Septic System Repair (RB-3)
46		System	Septic System Installation/Replacement (RB-4)
7		System	Septic System Installation/Replacement with Pump (RB-4P)
28		System	Alternative On Site Septic System (RB-5)
90		Acres	Vegetated Buffers on Residential Land
235	50	System	Pet Waste Composter
Education Programs			
Phase 1	Phase 2	**Units**	**Practice**
2	1	Program	Recreational Boater Education Program
2	2	Program	Residential Education Program (pet, septic, horse)
1	1	Program	Watermen Education Program
2	2	Program	Aquaculture (Oyster Gardening) Education Program
2	2	Program	Wildlife Education/Management Program
Other BMPs			
Phase 1	Phase 2	**Units**	**Practice**
14	16	System	Public Pet Waste Collection Facility/Signage/Supplies
3		System	Confined Canine Waste Control System
1		System	Marina Boat Waste Discharge Facilities

Table 2c. BMPs needed for Lower Piankatank watersheds – Wilton, Healy and Cobbs Creeks

Agricultural BMPs			
Phase 1	Phase 2	**Units**	**Practice**
17		Systems	Livestock Exclusion (LE-1T, SL-6AT)
1		System	Animal Waste Control Facility
30		Acres	Vegetated Buffer on Cropland
Residential BMPs			
Phase 1	Phase 2	**Units**	**Practice**
455	455	System	Septic Tank Pump Out (RB-1)
NA	NA	System	Septic Connection to Public Sewer
23		System	Septic System Repair (RB-3)
8		System	Septic System Installation/Replacement (RB-4)
2		System	Septic System Installation/Replacement with Pump (RB-4P)
8		System	Alternative On Site Septic System (RB-5)
60		Acres (seAp	Vegetated Buffers on Residential Land
102	25	System	Pet Waste Composter
Education Programs			
Phase 1	Phase 2	**Units**	**Practice**
2	2	Program	Recreational Boater Education Program
2	2	Program	Residential Education Program (pet, septic, horse)
1	1	Program	Watermen Education Program
2	2	Program	Aquaculture (Oyster Gardening) Education Program
2	2	Program	Wildlife Education/Management Program
Other BMPs			
Phase 1	Phase 2	**Units**	**Practice**
8	5	System	Public Pet Waste Collection Facility/Signage/Supplies
32		System	Confined Canine Waste Control System
5		System	Marina Boat Waste Discharge Facilities

INTRODUCTION

Background

Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry, Dancing Creeks and portions of the Upper Piankatank River are located within the counties of Mathews, Middlesex and Gloucester on Virginia's Middle Peninsula. These watersheds are subject to the ebb and flow of the tide through restricted inlets (poorly flushed inlets due to sedimentation at the outlets). Forests, wetlands and agriculture dominate the land use with only a small percentage of the land having been developed for residential use. The branching creeks are popular to those who enjoy crabbing, fishing, wildlife watching, boating and oyster gardening. Working waterfronts and eco-tourism have encouraged visitors and those seeking a water-based livelihood. The health of these waters and the habitat they support is closely linked to the enjoyment of those who choose to live and visit these creeks.

Farmer in Gwynns Island

The Clean Water Act (CWA), which became law in 1972, requires that all U.S. streams, rivers, and lakes meet their state's water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards, including narrative or numeric, chemical, physical, or biological criteria. Through this required program, the state of Virginia has found that many streams do not meet state water quality standards for protection of the five beneficial uses: fishing, swimming, shellfish, aquatic life, and drinking. Virginia submits a list on the health of all its waters to Congress every two years. No water body can be removed from the list until:

- Its problems are solved and standards are achieved or
- The designated uses not being achieved are removed after a detailed analysis clearly shows that they cannot be obtained
- Its impairment issues are solved and additional monitoring data and assessment reveals that the waters are no longer impaired

When water bodies fail to meet standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a water body. That is, it sets limits on the amount of pollution that a water body can assimilate and still maintain water quality standards. In order to develop a TMDL, background concentrations, point source and non-point source loadings are considered. A TMDL accounts for seasonal variations and must include a margin of safety. Through the TMDL process, states establish controls to reduce pollution in order to meet water quality standards.

Once a TMDL is developed, measures must be taken to reduce pollution levels in the stream. A TMDL Implementation Plan (IP) describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs) in the watershed, to be implemented in order to meet the water quality goals established by the TMDL. CWA regulations prohibit new discharges that "will cause or contribute to the violation of water quality standards."

Applicable Water Quality Standards

Water quality standards are designed to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (§62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC §1251 et seq.). Virginia Water Quality Standard 9 VAC 25-260-10 (Designation of uses.) states:

A. All state waters, including wetlands, are designated for the following uses: recreational uses, e.g., swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish.

E. At a minimum, uses are deemed attainable if they can be achieved by the imposition of effluent limits required under §§301(b) and 306 of the Clean Water Act and cost- effective and reasonable best management practices for nonpoint source control.

G. The [State Water Quality Control] board may remove a designated use which is not an existing use, or establish subcategories of a use, if the board can demonstrate that attaining the designated use is not feasible because:

1. Naturally occurring pollutant concentrations prevent the attainment of the use;

6. Controls more stringent than those required by §§301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.

(For a complete listing of this legislative reference regarding the Designation of Uses in Virginia waters, please go to:
http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC25-260-10

For a shellfish supporting water body to be in compliance with Virginia's bacteria standards for the production of edible and marketable natural resource use, the Virginia Department of Environmental Quality (DEQ) specifies the following criteria (9VAC 25-260-160):

" In all open or estuarine waters capable of propagating shellfish or in specific areas where public or leased private shellfish beds are present, and including those waters on which condemnation or restriction classifications are established by the State Department of Health, the following criteria for fecal coliform shall apply; the geometric mean fecal coliform value for a sampling station shall not exceed an MPN (most probable number) of 14 per 100 milliliters. The 90th percentile shall not exceed 49 MPN/100 ml."

For those waters that do not meet the criteria, Chapter 310 of the Administrative Code describes the process by which shellfish grown in restricted (condemned) waters can enter the commercial market, a process referred to as depuration or relaying.

Fecal Bacteria Impairments

Detection of fecal coliform bacteria in exceedence of the shellfish use standard are the cause of impairments in Virginia shellfish growing waters. This group of bacteria is considered an indicator of the presence of fecal waste. . Fecal coliform are associated with the fecal material derived from humans and warm-blooded animals, and their presence in aquatic environments is an indication that the water may have been contaminated by pathogens or disease-producing bacteria or viruses. Waterborne pathogenic diseases include typhoid fever, viral and bacterial gastroenteritis, and hepatitis A. Pathogens are concentrated in filter-feeding shellfish and can cause disease when eaten uncooked. Therefore, the presence of elevated numbers of fecal coliform bacteria is an indicator that a potential health risk exists for individuals consuming raw or undercooked shellfish. Fecal waste can enter waterways from point source inputs of treated sewage or from nonpoint sources by direct discharge or indirect runoff of human wastes (malfunctioning septic systems, overboard boat discharge, land application of municipal sewage sludge), and wastes from livestock, pets and wildlife.

The shellfish impairments of Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River are due to restrictions placed upon the commercial harvesting of shellfish from these waters in order to protect human health. Those restrictions, issued by the Virginia Department of Health, Division of Shellfish Sanitation (VDH-DSS), are based on monthly monitoring data. VDH-DSS collects monthly fecal coliform bacteria samples from each of its sampling stations in Virginia's tidal estuaries. VDH-DSS calculates a geometric mean based on the most recent 30 months of sampling data (approximately 2 1/2 years) to establish the current condemnation areas.

Sailboat moored along the Piankatank River

This IP outlines a strategy for reducing anthropogenic (sources of bacteria of human origin or a result of human impact upon the environment) loadings of bacteria to a level that complies with the TMDL. With completion of the IP, Virginia has identified a plan for meeting the water quality goals for these 16 shellfish growing areas and a means to enhance local natural resources. Additionally, the IP will enhance the opportunities for implementation funding.

STATE AND FEDERAL REQUIREMENTS FOR IMPLEMENTATION PLANS

In developing this IP both state and federal requirements and recommendations were followed. Virginia's 1997 WQMIRA directs the State Water Control Board (SWCB) to "develop and implement a plan to achieve fully supporting status for impaired waters" (§62.1-44.19:4 through 19:8 of the Code of Virginia), in order to produce an IP that is approvable by the Commonwealth. WQMIRA establishes that the implementation plan shall include:

- the date of expected achievement of water quality objectives,
- measurable goals,
- corrective actions necessary and
- the associated costs, benefits and environmental impacts of addressing the impairments.

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA does, however, outline the minimum elements of an approvable IP in its 1999 *Guidance for Water Quality-Based Decisions: The TMDL Process.* The listed elements include:

- a description of the implementation actions and management measures,
- a time line for implementing these measures,
- legal or regulatory controls,
- the time required to attain water quality standards, and

- a monitoring plan and milestones for attaining water quality standards.

It was suggested that the EPA recommendations be addressed in the IP, in addition to the required components as described by WQMIRA. In the case of Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River, it is necessary to develop pollution reductions among the various land uses contributing to the problems in the creeks and revisions to land management practices in the watershed to ensure that water quality standards can be attained. There are some permitted discharges within the area, and the one with the potential for bacteria contributions to shellfish waters contains a condemnation zone around it and will never be open to shellfish harvesting. The following VPDES permitted facilities exist within the project watershed boundaries:

Table 3: Permitted Discharges within the project boundaries

Name	VPDES number	VPDES type	Receiving Waterbody of Discharge
Gloucester Lumber Products	VA0077879	Industrial Stormwater Minor	Unnamed Tributary to Foxes Creek
William H. Milby Lumber Co.	VAR050659	Industrial General Stormwater	Zion Branch
Pitts Lumber Co.	VA0083011	VPDES Individual Industrial Minor	Unnamed Tributary to Dragon Run
Sea Farms, Inc.	VAG524046	Industrial General Seafood Processing	Milford Haven
Gwynns Island Seafood	VAG524088	Industrial General Seafood Processing	Milford Haven
Island Seafood Co.	VAG524053	Industrial General Seafood Processing	Milford Haven
Ginny's Point Marina	VAR051216	Industrial General Stormwater	Cobbs Creek
CF Bristow and Brothers	VAG840157	Industrial General Non-metallic Minerals	Unnamed Tributary to Dragon Run
Doc Jones Auto Parts	VAR051123	VPDES General Stormwater	Unnamed Tributary to Piankatank River
US Coast Guard Station, Milford Haven STP	VA0022373	Municipal Minor	Milford Haven
VA Community College System **	VA0028461	VPDES Individual Municipal Minor	Unnamed Tributary to Dragon Run

**Not included in the Upper Piankatank TMDL originally. The facility WLA is tracked within the implicit future growth of the watershed.

The EPA develops guidelines that describe the process and criteria used to award CWA Section 319 nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered during IP development to improve the likelihood of funding through this source. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the 319 requirements:

1. Identify the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the nonpoint source (NPS) pollution management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan.
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan;
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and if progress is being made towards attaining water quality standards; if not, identify the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

The process of incorporating these state and federal guidelines into an IP consisted of three major components:

1. Public participation
2. Implementation actions
3. Measurable goals and milestones.

Once developed, DEQ will present the IP to the SWCB for approval as the plan for implementing pollutant allocations and reductions contained in the TMDLs. DEQ will also request that the plan be included in the appropriate Water Quality Management Plan (WQMP), in accordance with the CWA's Section 303(e) and Virginia's Public Participation Guidelines for Water Quality Management Planning. As stated in the Memorandum of Understanding (MOU) between EPA and DEQ, DEQ will also submit a draft Continuous Planning Process to EPA where DEQ commits to regular updates of the WQMPs. The WQMP's will be the repository for all TMDLs and the TMDL IPs developed within a river basin.

REVIEW OF TMDL DEVELOPMENT

Water quality monitoring data, bacteria source assessments and the allocated reductions in the TMDL study were reviewed to determine the implications of the TMDLs on IP development.

As part of the TMDL development, bacterial source tracking (BST) sampling was conducted by DEQ in Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes and portions of the Upper Piankatank River. Bacterial source tracking is intended to aid in identifying sources (i.e., human, livestock, pet and wildlife) of fecal contamination in water bodies. The study used the antibiotic resistance approach (ARA) for the analysis which utilizes the premise that bacteria from different sources have different patterns of resistance to a variety of antibiotics. Samples were collected and analyzed on a monthly basis. The BST results were used to estimate the percentage of the bacteria load coming from each of the source sectors;

wildlife, human, livestock and pet. It should be noted that there are multiple methodologies used to perform BST, each with their own advantages and disadvantages. ARA has been the most widely used and published BST method to date; however, it is important to consider ARA results in conjunction with other knowledge of the watershed. BST is not a quantitative tool and was only intended to be used to identify and estimate potential source loads to the study area.

A simplified tidal volumetric model was used in the development of the Gwynns Island/Milford Haven and Upper Piankatank TMDLs. This method uses the volumes of the creeks being studied and the monitored fecal coliform concentrations to calculate the current load conditions. The creek volume and the State water quality standard were used to calculate the allowable load. For the Lower Piankatank, a steady-state tidal prism model was used to develop the TMDL. This method incorporates the influences of tidally induced transport, freshwater input, and removal of fecal coliform via decay. These factors along with the State water quality standards were used to calculate the allowable load. In both, the difference between the current load and the allowable load was then used to calculate the required reduction for each creek. Finally, the BST results were used to allocate loads to source sectors. The TMDLs for Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, and portions of the Upper Piankatank River are based on the 30-sample 90th percentile concentration, which was determined to represent the critical condition. The resulting loads and reductions from this analysis as adjusted by the source assessment performed in this IP are shown in Tables 4a, 4b and 4c.

The fecal bacteria TMDLs for these creeks were developed by DEQ. The TMDL studies titled *Piankatank River, Lower,* dated February 2005, *Piankatank River,Upper,* dated December 2005 and *Gwynns Island and Milford Haven Watersheds*, dated November 2007 are available on the internet via DEQ's website, http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx

This was also necessary in order to incorporate Frenchs, Ferry, Dancing, Barn, Lane and Hudgins Creeks which were condemned for the harvest of shellfish due to high fecal coliform concentrations, but were not included in the TMDL reports. The process used to determine the reductions needed in these watersheds will be explained in the "Assessment of Implementation Actions" section. Adjusted reduction amounts are listed in the tables below:

Table 4a. Gwynns Island/Milford Haven watershed load allocations and reductions needed

Watershed	Current Load mpn/day	Load Allocation	Reduction Needed
Queens Creek	3.09E+12	1.59E+11	95%
Stutts Creek	2.15E+12	6.69E+10	97%
Morris Creek	9.90E+11	1.80E+10	98%
Hudgins Creek	2.80E+11	1.90E+10	93%
Billups Creek	1.11E+12	3.68E+10	97%
Lanes Creek	1.36E+12	9.40E+10	93%
Edwards Creek	2.31E+12	2.03E+10	99%
Barn Creek	4.75E+11	1.02E+11	79%

Table 4b. Upper Piankatank watershed load allocations and reductions needed

Watershed	Current Load mpn/day	Load Allocation	Reduction Needed
Upper Piankatank	8.69E+12	1.21E+11	99%
Harper Creek	1.81E+12	3.73E+11	79%
Frenchs Creek	5.06E+11	1.32E+10	97%
Ferry Creek	1.93E+12	1.07E+11	94%
Dancing Creek	5.37E+11	5.88E+10	89%

Table 4c. Lower Piankatank watershed load allocations and reductions needed

Watershed	Current Load mpn/day	Load Allocation	Reduction Needed
Wilton Creek	9.16E+11	1.42E+11	84%
Healy Creek	1.07E+12	4.60E+10	96%
Cobbs Creek	1.16E+12	4.62E+10	96%

In waterbodies with approved TMDLs where there has been a down-gradient expansion of a condemned area, new TMDL calculations are not needed. These portions of the waterbody will be incorporated into "nested TMDL segments", meaning the reductions dictated in the "TMDL complete" segments in conjunction with implementation planning and subsequent implementation, are expected to provide mitigation necessary for the "TMDL complete" and expansion segments to meet water quality (see References in technical document for letter dated December 22, 2011 regarding DEQ nesting approach) standards. See Figures 1, 2 and 3 for TMDL segments and down-gradient expansions, which are covered in this implementation plan.

Figure 1: DEQ Completed TMDLs and Current VDH Condemnation Extents with Monitoring Locations

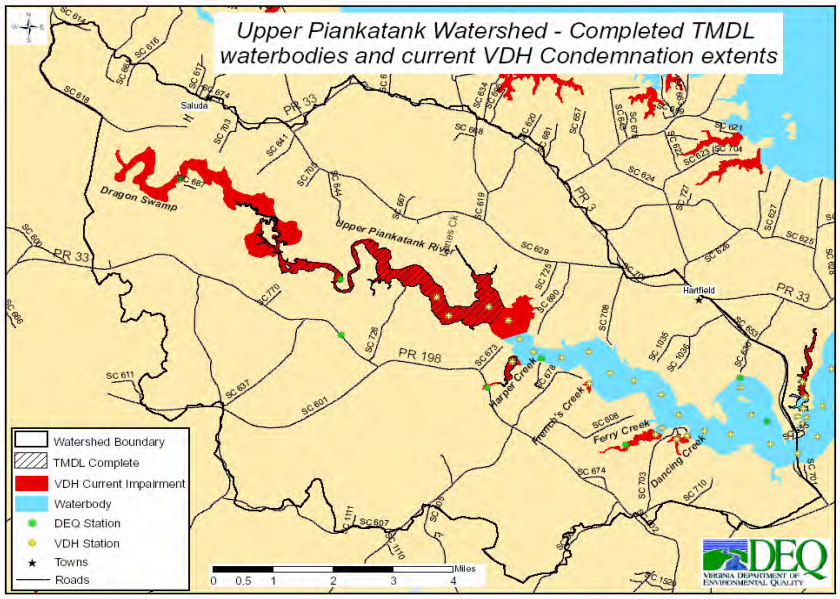


Figure 2: DEQ Completed TMDLs and Current VDH Condemnation Extents with Monitoring Locations

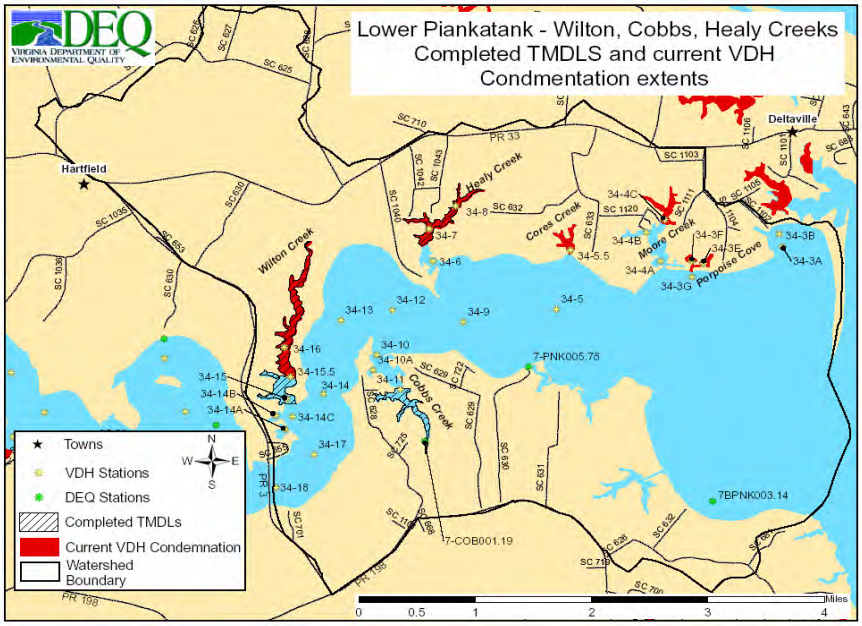
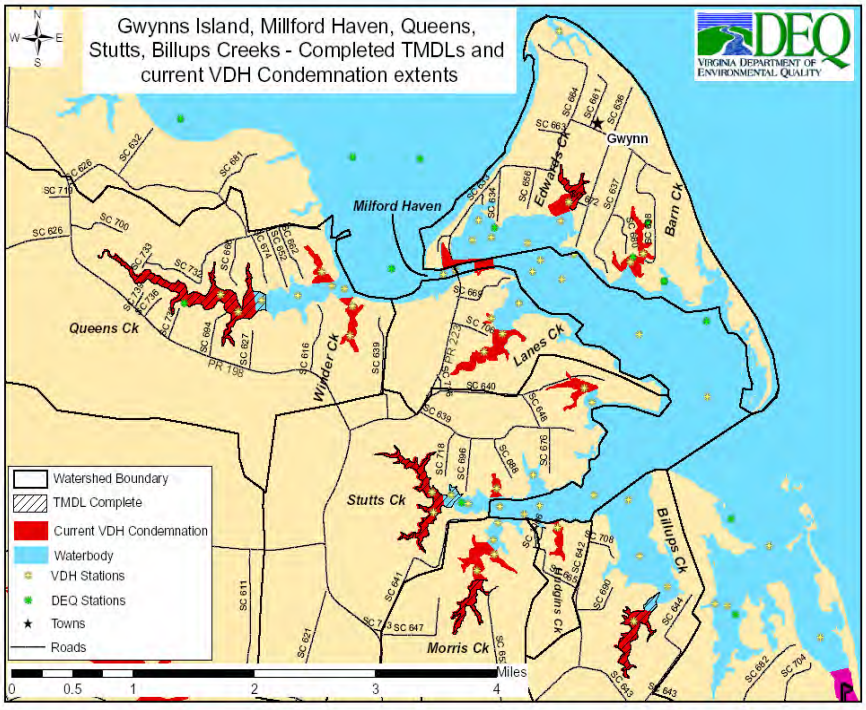


Figure 3: DEQ Completed TMDLs and Current VDH Condemnation Extents with Monitoring Locations



PUBLIC PARTICIPATION

Collecting input from the public on restoration and outreach strategies to include in the IP was a critical step in this planning process. Since the plan will be implemented primarily by watershed stakeholders on a voluntary basis with some financial incentives, local input and support are the primary factors that will determine the success of this plan. The actions and commitments compiled in this document were developed by citizens in the watershed, Mathews, Middlesex and Gloucester County governments, Tidewater Soil and Water Conservation District (TSWCD), DCR, DEQ, VDH-DSS, VIMS, Middle Peninsula Planning District Commission, Mathews Maritime Museum, Tidewater Oyster Growers Association, and citizens and business owners of the three counties. All citizens and interested parties in the watershed are encouraged to put the IP into action and contribute whatever possible to the restoration of these creeks.

Public Meetings for Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River

Public meetings were held to inform the public regarding the end goals and status of the IP project as well as to provide a means for soliciting participation in the smaller, more- targeted meetings (i.e., working groups). Working groups were assembled from communities of people with common concerns regarding the TMDL process and were the primary arena for seeking public input. The working groups formed were Residential/Recreational, Business (Agriculture, Watermen, Marinas) and Government.

Representatives of DCR and DEQ attended each working group meeting in order to facilitate the process and integrate information collected from the various attendees.

The first public meeting was held at the Hartfield YMCA in Middlesex County on May 23, 2012, 6:30-9 pm. The meeting was publicized in *The Virginia Register* and *The Gloucester Mathews Gazette Journal*. Signs were also posted throughout the watershed notifying the public of the meeting location and time. A substantial contact list developed prior to the meeting was also used to notify resident by e-mail. The meeting was attended by 59 people, including 49 citizens and 10 government agency representatives. Information discussed at the meeting included a general description of the TMDL process, a more detailed description of TMDL and IP development, and a solicitation for participation in working groups. At the meeting, it was determined that three working groups would best represent the interests in the watersheds: Residential/Recreational, Business (Agriculture, Watermen and Marinas), and Government. Those groups broke out into separate working group sessions during the latter portion of this meeting.

The final public meeting for was held on February 27, 2013 at the Mathews High School Library from 6-8pm, and was attended by 38 people, including 30 citizens and 8 government agency representatives. The primary purpose of this meeting was to present the draft IP. A presentation was given describing the implementation plan using major components as an outline: review of TMDL development, public participation, assessment of needs, cost/benefit analysis, and implementation. Maps with land use and VDH-DSS water quality monitoring stations were displayed, and tables of implementation actions for the 16 watersheds were displayed. Several copies of the draft implementation plan were made available but attendees were advised to check the DEQ website the following day in order to review the draft document and presentation. At this meeting, a local citizen read from her father's book "The

Bay" as a way to highlight the importance of the natural surroundings of the area. Information concerning the progress of restoring oyster harvests to the Lynnhaven River was also shared with the audience in order to highlight the benefits that can also be seen in improving water quality in shellfish growing areas.

Working Groups

Working Groups were formed to deal with a number of specific implementation issues, including agricultural, residential, watermen, marinas, and government. Their representation included members from the community, government employees, and members of other organizations with specific technical knowledge.

Both the Residential/Recreational (RRWG) and Business (BWG) working groups met twice during the development of the IP. The first RRWG meeting was held on May 23, 2012 and was attended by 22 people. The first BWG meeting was held on the same date and was attended by 11 people. At the first meeting, a series of questions was used to help guide both discussions. At the second meeting, the groups reviewed the updated source assessment for each watershed, developed BMP/corrective action scenarios for each watershed, discussed cost estimates for each BMP, and developed a timeline for implementation. The RRWG discussed methods needed to reduce human and pet sources of bacteria entering each of the creeks, recommended methods to identify failing septic systems and straight pipes (as well as promoting replacement of these), and provided input regarding BMPs that would be required. The BWG reviewed agricultural concerns and solutions, like the need to reach small horse "farmettes" with educational information on rotational grazing, the management of marina operations and their ability to address boating traffic pump out needs, and the concerns of area watermen. Efforts to promote aquaculture were stressed by this group as a way to bring people to the water through oyster gardening and for economic reasons, and for the added benefits seen to the overall health of the Chesapeake Bay.

Clean marina educational sign in Mathews County

The Government Working Group (GWG) met on October 23, 2012, and was attended by 15 people. The GWG addressed the resources and commitments of local, state and federal agencies that would contribute to the improved water quality of the creeks. Also discussed were existing regulatory control efforts, which may improve the quality of these creeks. Existing programs and funding opportunities were discussed, and a responsibility "action" table was reviewed and discussed as a starting point to beginning program implementation. A load reduction scenario from one of the watersheds was also shared with the group for them to observe our methods in selecting a suite of practices to address bacteria sources. A member was selected to represent the group on the Steering Committee.

The RRWG and BWG met a second time on August 27, 2012, as a combined group with 28 people attending. This meeting included the review of the land use maps and methods used to update bacteria sources for each creek, potential action scenarios for each creek, an update on No-Discharge Zone work being done in Gloucester County, and the selection of representatives from each working group to assist with the report to the Steering Committee. Attendees were given two weeks to respond back with better number estimates for the source count. A number of citizens provided written comments and reports on specific creek problems, their observed data and other issues of concern including the low lying ditches and maintenance concerns and possible connections to the impaired streams and flooded drainfields.

The Steering Committee (SC) met on January 15, 2013, and was attended by 8 people for the review of the updated bacteria sources and action scenarios for each creek and RRWG and BWG reports. In addition to the working group representatives, the committee was made up of agency representatives. The SC members also provided comments on the PowerPoint presentation for the February 27th public meeting. The SC made editorial and substantive suggestions for changes of the draft IP document via e-mails and ensured that all recommendations of the working groups were incorporated into the plan.

Overall, an impressive number of hours were spent by many community members and staff in the development of this plan. There was a consensus on the need for continued educational efforts for homeowners, farmers, watermen, pet owners, marina operators and boaters. There was also agreement on the need for strong partnerships between agencies and citizens who were trying for the same end goal: improve the creeks conditions for the benefit of existing and potential residents, and for those who simply visit.

ASSESSMENT OF IMPLEMENTATION ACTION NEEDS

Since the TMDLs were developed, various efforts have been made to make improvements in these watersheds by installing agricultural and residential BMPs. In particular, the Middle Peninsula Planning District Commission administered several Water Quality Improvement Fund grants and a low interest loan program over the last 7 years resulting in 1145 septic system pump outs and 49 septic system repairs and replacements throughout Mathews, Middlesex and Gloucester counties. This, coupled with the letters to citizens concerning mandatory septic system pump-outs every 5 years, has certainly contributed to bacteria reductions in these watersheds.

Due to the lack of analysis in the TMDL study as to the various delivery pathways (i.e., direct versus indirect) for the source load allocations that resulted from the BST analysis, and the potential changes in the watersheds from the TMDL study up to the IP process, a reassessment of the bacteria sources in the watersheds was conducted. The analysis was based on a

reassessment of the number of residences in the watersheds, quantification of human, pet, livestock and wildlife populations, an update of the shoreline sanitary survey and an estimation of agricultural applications of poultry litter and biosolids within the collective watershed. The daily fecal coliform contributions from each bacteria source were then quantified based on the population estimates, application rates and bacteria concentration values from scientific literature.

Additional segments in Gwynns Island-Milford Haven and Upper Piankatank watersheds were added in the impaired water list after the completion of TMDL studies. These segments are Frenchs Creek, Ferry Creek, Dancing Creek in Upper Piankatank watershed and Barn Creek, Lanes Creek and Hudgins Creek in the Gwynns Island-Milford Haven watershed. These segments are included in present water quality improvement plan. For these segments, source assessment, hydrologic and bathymetric data were collected from various sources. The existing loads and the allowable loads were then computed for each segment using the volumetric modeling approach. The bacteria levels from the nearest TMDL segments were used to compute existing loads. Allowable loads were computed based on the water quality standard of 49 MPN/100 ml. The current and allowable loads and the reductions needed are provided in Tables 4a and 4b. In the absence of any BST data, source allocation percentages among various sources (livestock, pet, human and wildlife) were adopted from the nearest TMDL segment.

Field surveys in the watershed, analysis of aerial imagery, input from stakeholder workgroups, and the TMDL study were used for bacteria source reassessment and evaluation of BMPs and various strategies which would be effective in reducing bacteria loads of the creeks. The workgroups considered BMPs by reflecting on cost estimates, effectiveness, and appropriateness based on the characteristics and needs of the watersheds.

The BMP and corrective action needs in the watersheds can be divided into four major categories; agricultural, residential, education programs and other.

Agricultural BMPs

Agricultural lands in the watersheds are predominantly row crops. The fields are generally well buffered, with buffer widths exceeding the requirements of the Chesapeake Bay Preservation Act (CBPA). Several fields in the Harper Creek watershed received septic waste, classified as Class B biosolids, in October 2010 and reportedly the applications were consistent with existing nutrient management plans and other applicable best practices for application of manure based nutrients. Nonetheless, these practices import bacteria into the watershed and present the potential for non-point source bacteria contributions to the creeks. Vegetated buffers are the only BMPs identified to address bacteria sources from cropland in the watersheds. At this time, there is no record of biosolids (sewage sludge) being spread in these 16 watersheds although should they be considered, they must be permitted by DEQ' Virginia Pollution Abatement (VPA) program and will require sludge analysis and inspection of application areas for proper set-backs.

The field surveys and stakeholder workgroups revealed very few livestock or horses in the any of the 16 watersheds. BMPs to address these small pastures include livestock exclusion and small acreage grazing systems to improve pasture and manure management practices and vegetated buffers. An animal waste control facility may be warranted in an area near Cobbs Creek where chicken houses were observed. The livestock exclusion with riparian buffers

BMP (LE-1T), the small acreage grazing system BMP (SL-6AT) and the animal waste control facility (WP-4) are cost-shared practices in the Virginia Agricultural Cost-Share Program for TMDL Implementation areas.

Table 5a. Agricultural BMPs needed for **Gwynns Island and Milford Haven**

		Agricultural BMPs	
Phase 1	Phase 2	**Units**	**Practice**
41		System	Livestock Exclusion (LE-1T, SL-6AT)
130		Acres	Vegetated Buffer

Table 5b. Agricultural BMPs needed for **Upper Piankatank Watersheds**

		Agricultural BMPs	
Phase 1	Phase 2	**Units**	**Practice**
41		System	Livestock Exclusion (LE-1T, SL-6AT)
60		Acres	Vegetated Buffer

Table 5c. Agricultural BMPs needed for **Lower Piankatank Watersheds**

		Agricultural BMPs	
Phase 1	Phase 2	**Units**	**Practice**
17		System	Livestock Exclusion (LE-1T, SL-6AT)
30		Acres	Vegetated Buffer
1		System	Animal Waste Control Facility

Residential BMPs

Residential BMPs focus on the maintenance and repair of septic systems, identification and elimination of illegal "straight pipe" sewage discharges, the replacement of failed septic systems, sewer connections for failing septic systems in the Hudgins watersheds, and minimization of pet waste runoff from homeowner's yards by installing pet waste composters, and vegetated buffers. A number of partner organizations can help landowners improve buffers, using tool such as LIDAR and VIMS shoreline situation reports to target optimal locations. Pet waste composters can be used at individual homes to provide a location to place and treat dog feces using enzymes. It is noted that consideration was given to the suitability of composter use in all of the 16 watersheds, based on proximity to water table, elevation and soil type. Their location will still need to be fine tuned during the project phase for distance to stream, slope and other factors. As an alternative, residents will be encouraged to place dog waste in their trash for pick-up.

To help target the implementation of septic improvement practices, the recently completed shoreline sanitary survey identified several deficiencies, and potential pollution sources. Additionally, Mathews, Middlesex and Gloucester counties have begun a strategy to enforce the CBPA requirement for septic tank pump outs every five years. The counties have mailed

septic pump-out notifications to all property owners, requiring the submission of documentation to prove the residence's septic tank has been pumped out or inspected within the past five years. As the counties identify non-compliant residences in the watersheds, they should be targeted for the appropriate implementation actions related to septic systems specified in Tables 6a, 6b, and 6c. It is noted that both Mathews and Middlesex counties contain areas that are not covered by the mandatory pump out requirement.

Table 6a. Residential BMPs needed for **Gwynns Island and Milford Haven Watersheds**

		Residential BMPs	
Phase 1	Phase 2	**Units**	**Practice**
1082	1082	System	Septic Tank Pump Out
3		System	Septic Connection to Public Sewer
35		System	Septic System Repair
33		System	Septic System Installation/Replacement
5		System	Septic System Installation/Replacement with Pump
26		System	Alternative On-Site Treatment System
160		Acres	Vegetated Buffer
108	25	System	Pet Waste Composter

Table 6b. Residential BMPs needed for **Upper Piankatank Watersheds**

		Residential BMPs	
Phase 1	Phase 2	**Units**	**Practice**
1455	1455	System	Septic Tank Pump Out
		System	Septic Connection to Public Sewer
51		System	Septic System Repair
46		System	Septic System Installation/Replacement
7		System	Septic System Installation/Replacement with Pump
28		System	Alternative On-Site Treatment System
90		Acres	Vegetated Buffer
235	50	System	Pet Waste Composter

*composter numbers for the Upper Piankatank reduced by ½

Table 6c. Residential BMPs needed for **Lower Piankatank Watersheds**

		Residentialial BMPs	
Phase 1	Phase 2	**Units**	**Practice**
455	455	System	Septic Tank Pump Out
		System	Septic Connection to Public Sewer
23		System	Septic System Repair
8		System	Septic System Installation/Replacement
2		System	Septic System Installation/Replacement with Pump

8		System	Alternative On-Site Treatment System
60		Acres	Vegetated Buffer
102	25	System	Pet Waste Composter

Bay buffer sign in Harcum, Virginia

Education Programs

In addition to standard BMPs, the workgroups identified several target audiences for educational outreach efforts. The first group is recreational boaters that use the public boat ramp and marinas in these watersheds along with other boaters that may enter the creek for recreational purposes. The focus of this educational effort will be to inform boaters about the availability of sanitary pump out facilities in the area and the detrimental impact overboard discharge of human waste can have on water quality. This educational effort may be in cooperation with DEQ's efforts to have some of the tidal creeks of the Middle Peninsula designated as No-Discharge Zones. This designation would further restrict vessels from discharging wastes even after the wastes have been treated by approved marine sanitation devices.

A second education program will address watermen working and residing in the creeks. This program will focus its message on proper bait and fish waste disposal and general shoreline "housekeeping" practices that can help control the wildlife concentrations in and near the creeks. The opportunity to participate in programs such as the NRCS-EQIP gear cycling to prevent the use of fouled gear in creeks will be encouraged. Educational materials may be provided through oyster seed companies in order to reach more watermen in the area.

Another educational program will focus on aquaculture education, or "oyster gardening". Funds may be used to support existing educational efforts, such as those by TOGA and VIMS, aimed at helping homeowners set up their own dockside oyster floats and offering a lecture series on the latest research in oyster culture. Oyster gardening provides greater filtration and builds stronger connections to local water quality.

Finally, there will be educational outreach efforts to residential property owners in the watersheds. The educational materials will address managing nuisance wildlife, pet waste management, proper care and maintenance of septic systems, and proper pasture management for horse owners. Proper septic system maintenance includes: knowing the location of the system components and protecting them (*e.g.*, not driving or parking on top of septic tanks or drainfields, not planting trees where roots could damage the system), keeping hazardous chemicals out of the system, minimizing or eliminating the use of garbage disposals, pumping out the septic tank every five years and knowing how to identify system problems. The EPA program "Septic Smart" can be used to reach homeowners (www.epa.gov/septicsmart). For those residents in Mathews and Middlesex counties where the five year pump outs are not mandatory, the educational materials will be particularly important in helping them realize the importance of septic system maintenance. And with the increasing popularity of horse ownership with rural landowners, practices and methods for healthy horse pastures will be provided via workshops and other outreach methods through the Tidewater SWCD and VCE.

Table 7a. Education programs needed for **Gwynns Island and Milford Haven**

		Education Programs	
Phase 1	Phase 2	**Units**	**Practice**
2	1	Program	Recreational Boater Education Program
3	3	Program	Residential Education Program (pet, septic, horse)
1	1	Program	Watermen Education Program
3	3	Program	Aquaculture (Oyster Gardening) Education Program
3	3	Program	Wildlife Education/Management Program

Table 7b. Education programs needed for **Upper Piankatank Watersheds**

		Education Programs	
Phase 1	Phase 2	**Units**	**Practice**
2	1	Program	Recreational Boater Education Program
2	2	Program	Residential Education Program (pet, septic, horse)
1	1	Program	Watermen Education Program
2	2	Program	Aquaculture (Oyster Gardening) Education Program
2	2	Program	Wildlife Education/Management Program

Table 7c. Education programs needed for **Lower Piankatank Watersheds**

		Education Programs	
Phase 1	Phase 2	**Units**	**Practice**
2	2	Program	Recreational Boater Education Program
2	2	Program	Residential Education Program (pet, septic, horse)

1	1	Program	Watermen Education Program
2	2	Program	Aquaculture (Oyster Gardening) Education Program
2	2	Program	Wildlife Education/Management Program

Kayaking in Mathews County

Other BMPs

The workgroup members and the shoreline sanitary survey identified kennels/hunt club in several of the watersheds, containing 30 dogs or more per kennel/hunt club – Upper Piankatank, 3; Queens Creek, 1; Stutts Creek, 4; Billups, 1; and Hudgins, 1. To address potential pet waste generated by this concentration of animals, follow-up outreach is needed to assess waste handling methods. Control measures for confined canines will be encouraged if they are determined necessary. Depending on the location, the number of animals present and other factors, this practice may be either a specialized septic system or a dry storage composting facility. To further reduce the bacteria contributions from pet waste in the these watersheds, the workgroups proposed installing public pet waste disposal stations at the marinas and public boat ramps to address the pet waste generated from dogs coming off of boats. Popular dog walking areas in each watershed, county parks, and neighborhoods are also possible locations for these stations. These public pet waste facilities could be maintained by the property owners where such facilities are erected or by volunteers through various civic groups. While it is noted that most people allow their dogs to run free or within an enclosure, with education on the importance of picking up dog waste it is expected that the usefulness of the dog waste bag stations will be more realized. In addition, solid waste disposal of pet waste in residential areas and at kennel operations will be encouraged through the educational programs as an alternative to the composters and septic systems.

An evaluation of available marina pump-out stations in the area through the 2012 boat survey conducted by VDH (based on transient boaters) and the NDZ research done by DEQ suggests that there may be a need for additional marina discharge facilities in a some of the creeks. Discussions in working groups also suggested that there were inoperable facilities in some areas, though some citizens did not believe that boat waste discharges were a significant problem.

Table 8a. Other BMPs needed for **Gwynns Island and Milford Haven**

		Other BMPs	
Phase 1	Phase 2	**Units**	**Practice**
20	38	System	Public Pet Waste Collection Facility/Signage/Supplies
7		System	Confined Canine Waste control System
3		System	Marina Boat Waste Discharge Facilities

Table 8b. Other BMPs needed for **Upper Piankatank Watersheds**

		Other BMPs	
Phase 1	Phase 2	**Units**	**Practice**
14	16	System	Public Pet Waste Collection Facility/Signage/Supplies
3		System	Confined Canine Waste control System
1		System	Marina Boat Waste Discharge Facilities

Table 8c. Other BMPs needed for **Lower Piankatank Watersheds**

		Other BMPs	
Phase 1	Phase 2	**Units**	**Practice**
8	5	System	Public Pet Waste Collection Facility/Signage/Supplies
2		System	Confined Canine Waste control System
5		System	Marina Boat Waste Discharge Facilities

Promotable BMPs, Programs and Partnerships

DEQ recently conducted an evaluation of the feasibility of establishing No-Discharge Zones (NDZ) for some of the tributaries in the Middle Peninsula and provided this information to the Middle District Planning Commission. The Go Green Committee of Gloucester County has expressed interest in pursuing NDZs in Gloucester County and the Gloucester County Board of Supervisors granted approval to the Committee in August 2012 to move forward with the investigation of NDZs. The Committee members, some of whom were a part of this IP's working groups, have been tasked with acquiring grant funds and technical assistance from VIMS to aid in that investigation which includes four creeks in this IP: Harper, Frenchs, Ferry and Dancing Creeks. The establishment of the NDZ in these tributaries may provide additional resources for marina discharge facilities and enforcement of the NDZ, resulting in possible improvements in bacterial contamination in those creeks.

Oyster reef restoration would be considered a promotable practice in areas where reef restoration experts have identified opportunities to be significant. The "Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan for Maryland and Virginia" dated September 2012 identified the Piankatank River as being one of the tidal streams having high potential for self-sustaining oysters and therefore a target for restoration at a large scale. Also, a program offered by the VA NRCS Aquaculture Program also provides oyster bed restoration through the placement of new shell on the river bottom, as well as a gear cycling program for watermen. The Chesapeake Bay Foundation also organizes groups of volunteers to assist with the construction of artificial oyster "reef" balls for placement in areas where restoration has

been prioritized. The Nature Conservancy and other partners are working in the Piankatank River to restore native oyster populations through the restoration of 4 small reefs. These restoration efforts, as well as the collection of oyster shells from area restaurants for artificial reef construction, will be encouraged in the area. The "Oysters for Life" initiative offers those without waterfront a chance to grow their own oysters. Some citizens requested that the dialogue concerning approaches to supporting oyster growing businesses to improve bay health should continue, perhaps through a Task Force or similar initiative.

A number of citizens in Mathews have been working extensively to correct roadside ditch maintenance concerns, referring to their project as the "Ditches of Mathews County". Some of those ditches are connected to these TMDL creeks and are believed to contribute to a saturated environment including an accumulation of muck (undecomposed plant matter) that encourages bacteria growth. They are working with Mathews County and the Virginia Department of Transportation to keep pipes and receiving outfall channels open to allow stormwater in roadside ditches to reach TMDL waters without overflowing into wooded wildlife areas where additional fecal coliform from wildlife waste could reach streams. The citizens believe that roadside ditches which remain flooded for weeks and months at a time also increase the risk of septic system failures in certain areas by causing saturation of homeowner properties and reducing the efficiency of septic system operation. It is recommended that one outcome of this IP process be the development of a Task Force to direct additional research and coordination of drainage ditch maintenance, and possible sources of funding to address ditch maintenance. It is noted that Mathews County has a county ditch maintenance program.

Phased Implementation

In most of the sixteen watersheds it appears that a large portion of the reductions necessary to reach water quality standards will be completed within Phase 1. Upon completion of initial implementation (Phase 1), water quality will be re-assessed to determine if the water quality standard is attained. If water quality standards are not being met, the local citizens may elect to move forward with Phase 2 implementation to address the fecal coliform contribution from wildlife through a wildlife management plan, which involves the evaluation of wildlife populations and the management of them at sustainable levels based on local citizen's objectives (wildlife education covered in Phase 1). Phase 2 will also include the septic pump outs, which are required every 5 years, as well as pet waste composters and bag stations and continued educational programming.

COST / BENEFIT ANALYSIS

Cost estimates of the agricultural, residential, and other BMPs in this plan were calculated by multiplying the unit cost by the number of BMP units in each watershed. The unit cost estimates for the agricultural BMPs were derived from DCR's Agricultural Cost-Share Database. Average costs for BMP installations in Mathews, Middlesex and Gloucester Counties were used where sufficient data existed, otherwise, Middle Peninsula average costs were used. The unit costs for residential practices were developed through discussions with the local health department, the workgroups and estimates from previous TMDL IPs. DCR grant-funded septic system projects in the area were also useful for determining practice costs. Estimates for education programs are based on target audience size and experiences in other TMDL IPs, as well as consultation with non-profit groups that offer similar educational programs. Estimated implementation costs for each BMP are listed in Table 9a, 9b and 9c. Total Phase 1 (years 1-5) implementation cost estimates are as follows:
Gwynns Island/Milford Haven watersheds = $ 2,084,600
Upper Piankatank watersheds = $2,227,150

Lower Piankatank watersheds = $836,300

Additional Phase 2 (years 6-10) implementation could be considered in order to fully implement TMDL load allocations. Phase 2 cost estimates are as follows:
Gwynns Island/Milford Haven watersheds = $397,150
Upper Piankatank watersheds=$482,600
Lower Piankatank watersheds=$177,750

The primary benefit of this implementation plan is cleaner waters in Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River. The goal is to implement the IP so that fecal contamination may be reduced and allow for the removal of the condemnation of the shellfish growing areas. There is commercial oyster culture and harvesting throughout the area, and it would be good to have additional opportunities in these condemned creeks. The oysters growing in these creeks are being grown by property owners using dockside floats. The principal benefit to the oyster growers in these creeks would be that once the water quality is restored, they would no longer need to transport their floats to clean water to depurate the oysters prior to consumption. All of these creeks already meet the state water quality standards for safe swimming. However, further reducing fecal contamination levels in these creeks, particularly from human sources will improve public health by reducing the risk of infection from fecal sources through contact with surface waters.

The residential programs will play an important role in improving water quality, but there may also be additional return on the investment in terms of economic benefits to homeowners. An improved understanding of private on-site sewage systems (including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance) will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. A home's value can be decreased by 40% due to a failed septic system (Shepherd, 2006). The average septic system will last 20-25 years if maintained properly. The replacement of failing on- site sewage disposal systems with new septic or alternative treatment systems will have a direct and substantial impact, improving property values, and improving the local economy.

Sediment and nutrient reductions from BMPs that are installed to reduce bacteria loadings also help eliminate populations of bacteria in in-stream sediments. As well, BMPs installed for the purpose of reducing bacteria provide benefits to the overall Chesapeake Bay (CB) nutrient and sediment reductions that help make progress towards meeting the CB TMDL and overall improved Bay health.

Growing oysters off the dock

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians, and a healthy economic base enhances the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document are expected to provide economic benefits, as well as environmental benefits, to the property owners in these watersheds.

Table 9a. Estimated implementation total costs for Gwynns Island & Milford Haven watersheds – Edwards, Barn, Queens, Stutts, Morris, Billups, Lanes, Hudgins Creeks

Implementation Costs				
Units	**Practice**	**DSWC Practice Number**	**Per Unit Cost**	**Estimated Cost**
41	Livestock Exclusion	LE-1T, SL6-AT	$8,000 – $ 15,000	$496,000
130	Vegetated Buffer on Cropland	WQ-1	$ 400	$52,000
1082	Septic Tank Pump Out	RB-1	$ 300	$324,600
3	Septic Connection to Public Sewer	RB-2	$ 5,600	$16,800
35	Septic System Repair	RB-3	$ 3,000	$105,000
33	Septic System Installation/Replacement	RB-4	$ 6,000	$198,000
5	Septic System Installation/Replacement with Pump	RB-4P	$ 6,500	$32,500
26	Alternative on Site Systems	RB-5	$ 25,000	$650,000
2	Recreational Boater Education Programs		$ 3,000	$6,000
3	Residential Education Programs		$ 2,500	$7,500
1	Watermen Education Programs		$ 2000	$2,000
3	Aquaculture Education Programs		$2000	$6,000
160	Vegetated Buffers (residential)		$ 400	$64,000
7	Confined Canine Waste Control System		$ 6,000	$42,000
108	Residential Pet Waste Composters		$ 50	$5,400
20	Public Pet Waste Collection Facility/Signage/Supplies		$ 600	$28,800
3	Marina Boat Waste Discharge Facilities		$ 6,000	$18,000
3	Wildlife Education/Management Program		$10,000	$30,000
Phase 1 Total				$2,084,600
Optional - Phase 2 Implementation Costs				
3	Wildlife Management Program		$10,000	$30,000
1082	Septic Tank Pump-out	RB-1	$300	$324,600
25	Pet Waste Composters		$50	$1,250
1	Recreational Boater Education Programs		$ 3,000	$3,000
3	Residential Education Programs		$ 2,500	$7,500
1	Watermen Education Programs		$2,000	$2,000
3	Aquaculture Education Programs		$2,000	$6,000
38	Public Pet Waste Collection Facility/Signage/Supplies		$600	$22,800
Optional - Phase 2 Total				$397,150
Total				$2,481,750

Table 9b. Estimated implementation total costs for Upper Piankatank watersheds – Upper Piankatank River and Harper, Frenchs, Ferry and Dancing Creeks

Implementation Costs				
Units	**Practice**	**DSWC Practice Number**	**Per Unit Cost**	**Estimated Cost**
41	Livestock Exclusion with Riparian Buffers	LE-1T, SL-6AT	$8,000-$ 15,000	$475,000
60	Vegetated Buffer on Cropland	WQ-1	$ 400	$24,000
1455	Septic Tank Pump Out	RB-1	$ 300	$436,500
	Septic Connection to Public Sewer	RB-2	$ 5,600	$
51	Septic System Repair	RB-3	$ 3,000	$153,000
46	Septic System Installation/Replacement	RB-4	$ 6,000	$276,000
7	Septic System Installation/Replacement with Pump	RB-4P	$ 6,500	$45,500
28	Alternative on Site Systems	RB-5	$ 25,000	$700,000
2	Recreational Boater Education Programs		$ 3,000	$6,000
2	Residential Education Programs		$ 2,500	$5000
1	Watermen Education Programs		$2,000	$2,000
2	Aquaculture Education Programs		$2,000	$4,000
90	Vegetated Buffers (residential)		$ 400	$36,000
3	Confined Canine Waste Control System		$ 6,000	$18,000
235	Residential Pet Waste Composters		$ 50	$11,750
14	Public Pet Waste Collection Facility/Signage/Supplies		$ 600	$8,400
1	Marina Boat Waste Discharge Facilities		$ 6,000	$6,000
2	Wildlife Education/Management		$10,000	$20,000
Phase 1 Total				$2,227,150
Optional - Phase 2 Implementation Costs				
2	Wildlife Management Program		$10,000	$20,000
1455	Septic Tank Pump-out	RB-1	$300	$436,500
50	Pet Waste Composters		$50	$2,500
1	Recreational Boater Education Programs		$ 3,000	$3,000
2	Residential Education Programs		$ 2,500	$5,000
1	Watermen Education Programs		$2,000	$2,000
2	Aquaculture Education Programs		$2,000	$4,000
16	Public Pet Waste Collection		$600	$9,600
Optional - Phase 2 Total				$482,600
Total				$2,709,750

Table 9c.Estimated implementation total costs for Lower Piankatank watersheds – Wilton, Healy and Cobbs Creeks

Implementation Costs				
		DSWC Practice	**Per Unit**	**Estimated**
17	Livestock Exclusion with Riparian Buffers	LE-1T, SL-6AT	$8,000-$ 15,000	$206,000
30	Vegetated Buffer on Cropland	WQ-1	$ 400	$12,000
1	Animal Waste Control Facility	WP-4	$38,900	$38,900
455	Septic Tank Pump Out	RB-1	$ 300	$136,500
	Septic Connection to Public Sewer	RB-2	$ 5,600	
23	Septic System Repair	RB-3	$ 3,000	$69,000
8	Septic System Installation/Replacement	RB-4	$ 6,000	$48,000
2	Septic System Installation/Replacement with Pump	RB-4P	$ 6,500	$13,000
8	Alternative on Site Systems	RB-5	$ 25,000	$200,000
2	Recreational Boater Education Programs		$ 3,000	$6,000
2	Residential Education Programs		$ 2,500	$5,000
1	Watermen Education Programs		$2,000	$2,000
2	Aquaculture Education Programs		$2,000	$4,000
60	Vegetated Buffers (residential)		$ 400	$24,000
2	Confined Canine Waste Control System		$ 6,000	$12,000
102	Residential Pet Waste Composters		$ 50	$5,100
8	Public Pet Waste Collection Facility/Signage/Supplies		$ 600	$4,800
5	Marina Boat Waste Discharge Facilities		$ 6,000	$30,000
2	Wildlife Education/Management		$10,000	$20,000
Phase 1 Total				$836,300
Optional - Phase 2 Implementation Costs				
2	Wildlife Management Program		$10,000	$20,000
455	Septic Tank Pump-out	RB-1	$300	$136,500
25	Pet Waste Composters		$50	$1,250
2	Recreational Boater Education Programs		$ 3,000	$6,000
2	Residential Education Programs		$ 2,500	$5,000
1	Watermen Education Programs		$2,000	$2,000
2	Aquaculture Education Programs		$2,000	$4,000
5	Public Pet Waste Collection Facility/Signage/Supplies		$600	$3,000
Optional - Phase 2 Total				$177,750
Total				$1,014,050

STAKEHOLDER ROLES AND RESPONSIBILITIES

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private citizens, and special interest groups. Achieving the goals of the Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River TMDL IP effort (*i.e.*, improving water quality and removing these waters from the impaired waters list) is dependent on stakeholder participation. Both the local stakeholders who are charged with the implementation of control measures and the government stakeholders who are responsible for overseeing human health and environmental programs must first acknowledge there is a water quality problem, and then make the needed changes in operations, programs, and legislation to address the pollutants. Stakeholders will help guide the implementation of practices, and evaluate approaches during Phase 2 implementation based on the success of approaches during Phase 1.

The **EPA** has the responsibility for overseeing the various programs necessary for the success of the Clean Water Act. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are five state agencies responsible for regulating and providing educational outreach for activities that impact water quality with regard to this implementation plan. These agencies include: Department of Environmental Quality, Department of Conservation and Recreation, Department of Health, Department of Agriculture and Consumer Services (VDACS), and VA Cooperative Extension (VCE).

DEQ has responsibility for monitoring the waters to determine compliance with state standards, and for requiring permitted point source dischargers to maintain pollutant loads and concentrations within permit limits. They have the regulatory authority to levy fines and take legal action against those in violation of permits. There are several permitted point source discharges in these three watersheds under purview of DEQ. Some facilities fall under the Virginia Pollution Discharge Elimination System (VPDES) program and others fall under the Virginia Pollution Abatement (VPA) General Permit regulation for Poultry Waste Management and the Biosolids Management Program. Violations of permit requirements are handled via corrective actions with the facility through the compliance and enforcement program at DEQ. DEQ also deals with aspects of the Biosolids Management Program. Additionally, DEQ is responsible for presenting this IP to the SWCB for approval as the plan for implementing pollutant allocations and reductions contained in the TMDLs. DEQ also works with localities to assist in the development of No-Discharge Zones for local waters.

DCR manages numerous programs for addressing nonpoint sources of pollution. Historically, most DCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the TMDL- required 100% participation of stakeholders. To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentives under this program have been adjusted to account for 100% participation. It should be noted that DCR does not have regulatory authority over the majority of NPS issues addressed in this document. Their Division of Chesapeake Bay Local Assistance enforces compliance with the Chesapeake Bay Preservation Act, including septic pump out requirements and the protection of Resource Protection Areas (RPA's) and Resource Management Areas

(RMA's).

Through Virginia's Agricultural Stewardship Act, the **VDACS Commissioner of Agriculture** has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis. If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. The enforcement of the Agricultural Stewardship Act is entirely complaint-driven.

VDH is responsible for maintaining safe drinking water measured by standards set by EPA. Their duties also include On-Site Sewage Disposal regulation. Like VDACS, VDH's program is complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation from a failed septic system that may take many weeks or longer to achieve compliance. VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes (Sewage Handling and Disposal Regulations, 12 VAC 5-610-10 *et seq*.) Their Division of Shellfish and Sanitation (DSS) is responsible for protecting the health of the consumers of shellfish and by ensuring that growing waters are properly classified for harvesting. DSS monitors water quality in shellfish growing areas, provide shellfish closings and sanitary surveys to identify deficiencies along the shoreline. They also administer the Clean Marina Program to address the proper operation of pump out facilities and boater education.

VCE is an educational outreach program of Virginia's land grant universities (Virginia Tech and Virginia State University), and a part of the national Cooperative State Research, Education and Extension Service, an agency of the United States Department of Agriculture. VCE is a product of cooperation among local, state and federal governments in partnership with local citizens. VCE offers educational outreach and technical resources on topics such as crops, grains, livestock, dairy, horse pasture management, natural resources and environmental management. VCE has several publications related to TMDLs and is promoting water quality education and outreach methods to citizens, businesses and developers regarding necessary pet waste reductions. For more information on publications and county extension offices, visit www.ext.vt.edu.

VADOF (Virginia Department of Forestry) has prepared a manual to inform and educate forest landowners and the professional forest community on proper BMPs and technical specifications for installation of these practices in forested areas (www.dof.state.va.us/wq/wq-bmp-guide.htm). Forestry BMPs are intended to primarily control erosion. For example, streamside forest buffers provide nutrient uptake and soil stabilization, which can benefit water quality by reducing the amount of nutrients and sediments that enter local streams. They will assist landowners with buffer improvements.

VDGIF: Virginia Department of Game and Inland Fisheries manages Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth; provides opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation; and promotes safety for persons and property in connection with boating,

hunting, and fishing. The VDGIF has responsibility for administering certain U.S. Fish and Wildlife Service funding programs. Personnel participate, review, and comment on projects to insure consideration for fish and wildlife populations and associated habitats. They will assist with wildlife education and management programs.

The **Natural Resources Conservation Service** (NRCS) is the federal agency that works hand-in-hand with the American people to conserve natural resources on private lands. NRCS assists private landowners with conserving their soil, water, and other natural resources. Local, state and federal agencies along with policymakers also rely on the expertise of NRCS staff. NRCS is a major funding stakeholder for impaired water bodies through the CREP and EQIP programs. Their Shellfish Aquaculture program is available in this IP area.

The **Tidewater SWCD** works with many agricultural producers in the region to improve agricultural practices and minimize impacts to the area waterways. In this heavily cropped and forested region, they play an integral role in developing and implementing natural resource protection strategies. In addition to the farming community, they work with citizens on erosion and sediment related compliance concerns and encourage innovative techniques for dealing with stormwater. Their rain barrel workshops are very popular with homeowners, and their diverse partnerships add to their ability to convey a variety of water quality related education programs across the region.

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. The counties of **Gloucester, Mathews** and **Middlesex** have each established local Bay Act programs under the authority of the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. These local programs protect water quality by managing land use, development and redevelopment activities through provisions within each county's local code. The requirements of the local programs apply within the areas designated as Chesapeake Bay Preservation Areas (CBPAs) by each locality. Gloucester County has designated CBPAs jurisdiction-wide, while Mathews and Middlesex have limited the designation to only a portion of each county. The CBPA requirements include the designation of vegetated 100 foot riparian buffers and reserve drainfields on plats and plans of development and documentation of inspection/pump-out and maintenance of on-site septic systems every five years. Each local government has established a program to notify subject property owners and track the status of on-site septic systems in order to document enforcement. All three counties are committed to pet owner education, possibly through dog licensing or other regular mailings to landowners, but would need assistance through other area groups like the TSWCD for the content of materials. They also considered including water quality educational information in tax bills and pump-out reminder notices for greater citizen awareness of these issues. The counties will be a key partner with other stakeholders in seeking grant funds to repair/replace failing on-site sewage disposal systems and to fund the various educational programs proposed in the IP.

The **Middle Peninsula Planning District Commission** assists with regional planning needs and provides a variety of technical and program services to member local governments, including grant application assistance, management services for program implementation, land use planning services and mapping. Transportation planning including highway development, ridesharing, airport planning, and specialized transit is another role filled by PDC's in the state.

The **Mathews Maritime Museum** is owned and operated by the Mathews Maritime Foundation. Established in 1998, the Foundation is a non-profit organization dedicated to preserving and protecting Mathews County's maritime and cultural heritage through research, conservation, documentation and education. The Foundation sponsors programs like the Kids Kayak Camp, Chesapeake Bay Days, Maritime Heritage Trail, Maritime Heritage Day Celebration, Donor Boat Program, Family Boat Building, Monthly Speaker Meetings, Restoration of the Peggy of New Point, and produces a Maritime Calendar.

The **Ditches of Mathews County** is a grass roots volunteer project working toward the restoration of fully maintained and functional VDOT storm water management ditches to reduce maintenance expense for our roads, prevent septic system impairment, eliminate mosquito nurseries, reduce the potential for bacterial contamination and conduct clean water to our waterways as nature intended.

The **Tidewater Oyster Growers Association** (TOGA) provides "oyster gardening" training for waterfront homeowners because of the benefits for water quality and the satisfaction of growing their own oyster crop. Other grassroots groups may form specifically around the protection and restoration of these three watersheds and others in the county. For further information on TOGA, visit www.oystergardener.org.

The **Chesapeake Bay Foundation** (CBF) provides various educational programming for adults and children throughout the bay watershed aimed at restoring over bay water quality. Some of those programs include the construction of oyster "reef" balls to restore native oyster populations, and assistance to oyster gardeners with supplies for their dock-side oyster floats. They will be a vital partner in providing educational materials and technical assistance for workshops.

The **Virginia Institute of Marine Science** (VIMS) provides technical assistance and research on issues related to the restoration of Virginia's tidal watersheds. Their Center for Coastal Resource Management periodically conducts shoreline inventories that indicate the need for buffers and various shoreline stabilization techniques. Their **Shoreline Situation Reports** for the counties involved in the plan will be useful in identifying locations for buffer improvements. A **Shellfish Aquaculture Extension Specialist** is also available through VIMS to assist with watermen coordination in the area.

The **Gloucester Green Committee** is a committee established by Gloucester County that aids in "greening" various county programs. They have played an active role in evaluating the NDZ for the county. They will assist with countywide educational outreach related to this project.

The **Nature Conservancy** has worked in Virginia since 1960 to protect the Commonwealth's land and water. While perhaps most know in Virginia for their extensive land conservation, they too have been working in the shellfish waters to restore native oyster populations. The Piankatank River has been a focus in recent years for their reef restoration projects. They will partner with others to continue that work and assist landowners with riparian buffer improvements.

The **Alliance for the Chesapeake Bay** is a regional nonprofit organization that builds and fosters partnerships and consensus to protect and to restore the Chesapeake Bay. They assist

with educational programming and coordinate water quality monitors across the state. They will assist with identifying groups and individuals to monitor hotspots for bacteria pollution.

Bay Country Kayaks is a family-owned kayak eco-tour company founded for the purpose of educating other of the ecological, cultural and historical significance of coastal Virginia waterways. The staff is interested in supporting water quality monitoring efforts.

Table 11. Implementation Responsibilities - Gwynns and Milford Haven, Upper and Lower Piankatank watersheds

Implementation Responsibilities			
Practice	**Implementation Responsibility**	**Oversight Responsibility**	**Potential Funding**
Livestock Exclusion//buffers	Landowners, SWCD	SWCD	Cost-Share
Small Acreage Grazing System	Landowner/SWCD	SWCD	Cost-Share
Animal Waste Control Facility	Landowners/SWCD	SWCD/Counties	Cost-Share
Vegetated Buffer on Cropland	Landowner/SWCD	SWCD/Counties TNC/DOF	Incentives
Septic Tank Pump Out	Landowner/MMPDC	Counties/VDH	Private/Grant
Septic Connection to Sewer	Landowner/Public Works/MMPDC	Counties/VDH/	Private/Grant
Septic System Repair	Landowner/MMPDC	Counties/VDH	Private/Grant
Septic System Installation/Replacement	Landowner/MMPDC	Counties/VDH	Private/Grant
Septic System Installation/ Replacement with Pump	Landowner/MMPDC	Counties/VDH	Private/Grant
Alternative on Site Systems	Landowner/MMPDC	Counties/VDH	Private/Grant
Recreational Boater Education Programs	DEQ/VDH Local Citizen Groups	None	Grant
Residential Education Programs	Local Citizen Groups County/SWCD/YRSCB	None	Grant
Watermen Education Programs	DEQ/VDH/VIMS Local Citizen Group	None	Grant
Aquaculture Education/Action Program (float building, restaurant shell collection)	TOGA, VIMS, CBF, NRCS, YRSCB	None	Grant/NRCS
Vegetated Buffers (Residential)	Landowner, VIMS, TNC, DOF	County (CBPA)	Grant
Residential Pet Waste Composters	Landowner/SWCD	None	Grant

Public Pet Waste Collection Facility/Signage/Supplies	County Parks and Rec. /Marinas/Citizen Groups/Veterinarians/ SWCD	None	Grant
Confined Canine Control System	Hunt Clubs/Kennels SWCD/ citizen groups	None	Grant

Successful implementation depends on stakeholders taking responsibility for their role in the process. While the primary role falls on the landowner, the local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. While it is unreasonable to expect that the natural environment (*e.g.*, creeks and rivers) can be made 100% free of risk to human health, it is possible and desirable to minimize pollution related to humans. Virginia's approach to correcting NPS pollution problems has been, and continues to be, primarily encouragement of participation through education and financial incentives. However, this IP identified several regulatory controls (i.e., Sewage Handling and Disposal Regulations, Chesapeake Bay Preservation Act and Agricultural Stewardship Act) that could foster implementation actions. It is noted that while this IP has been prepared for bacteria impairments in the 16 watersheds, many of the BMPs will also result in reductions in nutrients and sediment reaching the Chesapeake Bay and therefore contribute also to the improvements called for in the Chesapeake Bay Watershed Implementation Plan.

Wetlands along Harper Creek

MEASURABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS

Timeline and Milestones

The goals of implementation are restored water quality in Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy, Cobbs, Lanes, Hudgins, Barn, Frenchs, Ferry and Dancing Creeks and portions of the Upper Piankatank River, the removal of the shellfish growing areas from Virginia's Section 303(d) impaired waters list, and the lifting of the shellfish condemnations on the creeks. Progress toward the end goals will be assessed during implementation through tracking of BMP installations and continued water quality monitoring. Phase 1 implementation is estimated to take five years. The septic BMPs identified in the implementation plan, including repairs, replacements and pump outs, will be continuous over a five year maintenance cycle. The five year timeframe identified for implementation may be accelerated at the discretion of the local stakeholders based on funding availability.

Year 1 will include residential education programs focused on septic system maintenance, pet waste management and nuisance wildlife management and the implementation of the septic BMPs to correct the deficiencies identified in the last shoreline sanitary survey and CBPA septic pump out enforcement program for each county. Opportunities for confined canine units and pet waste educational signage and bag stations will be included.

Year 2 of implementation will include residential education programs focused on pet waste management, the distribution and installation of residential pet waste composters and the expansion of vegetated buffers. Septic tank pump outs will continue to be implemented by residents identified as reaching the five year point since their last documented septic service. Opportunities for livestock exclusion and grazing systems will be included.

Year 3 includes education programs for watermen, recreational boaters, and those interested in aquaculture. BMP installation will focus on the agricultural practices. Septic pump outs will continue to be implemented by residents identified as reaching the five year point since their last documented septic service. Pet waste BMPS (composters and bag stations) will continue.

Year 4 of implementation will include a residential education program focused on onsite waste treatment system operations and maintenance. BMP installation will include the public pet waste collection facilities, the confined canine waste control system and additional vegetated buffers. Septic tank pump outs will continue to be implemented by residents identified as reaching the five year point since their last documented septic service.

Year 5 of the implementation plan provides an opportunity to complete any BMPs or education programs that were not able to be completed as scheduled. Septic tank pump outs will continue to be implemented by residents identified as reaching the 5 year point since their last documented septic service.

Upon completion of the five year Phase 1 implementation period, all of the BMPs and education programs identified in this plan should have been implemented, thereby addressing all human sources of bacteria. If fecal coliform reductions associated with the types and numbers of recommended practices show bacteria loads below the TMDL, the creeks will be on track for delisting, assuming those reduced loads are maintained and no new bacteria sources are added.

Upon completion of Phase 1 implementation, water quality data will be reassessed to determine if the water quality standard is attained. If water quality standards are not being met, the local citizens may elect to move forward with Phase 2 (years 6 -10) implementation to address the fecal coliform contribution from wildlife through a wildlife management plan, additional septic pump outs and pet waste BMPs. A UAA may be initiated to reflect the presence of naturally high bacteria levels due to uncontrollable sources. The outcomes of the UAA may lead to the

determination that the designated use(s) of the waters may need to be changed to reflect the attainable use(s).

Tracking Implementation

Tracking of BMP implementation will serve as an interim measure of progress toward improving water quality in these creeks. Agricultural BMPs installed through the Virginia Agricultural Cost-Share Program will be tracked in the Agricultural Cost-Share Database. Repairs or replacements of on-site septic systems and straight pipes identified in the shoreline sanitary survey as discrepant will be tracked through the VDH and can be monitored on their website at http://www.vdh.state.va.us/EnvironmentalHealth/Shellfish/documents/shoreline_survey.pdf Mathews, Middlesex and Gloucester counties will track pump outs and associated compliance rates as part of their CBPA enforcement strategy. Some grant funded projects will also require that data tracking forms be provided as a means of BMP documentation.

Monitoring

Improvements in water quality and implementation progress will ultimately be determined through monitoring conducted by VDH-DSS at the established bacteriological monitoring stations in accordance with its shellfish monitoring program. DEQ will continue to use data from these monitoring stations and related ambient monitoring stations to evaluate improvements in the bacterial community and the effectiveness of TMDL implementation in attainment of the general water quality standard. VDH-DSS water quality monitoring data can be accessed using the agency's GIS Data Viewing tool which uses Google Earth at:

http://www.vdh.state.va.us/EnvironmentalHealth/Shellfish/documents/ShellfishSanitation.kml. (also see Figures 1-3)

Additional monitoring may be conducted by citizen monitors to better identify bacteria source "hot spots" and the effectiveness of implementation actions. Citizen monitors will use Coliscan Easygel to perform monthly monitoring of *Escherichia coli (E. coli)* bacteria. Through comparison studies performed by DEQ, Coliscan has proven to be a good screening tool in estimating *E. coli* density. In addition, Coliscan Easygel is about 1/10th the cost of typical laboratory monitoring, allowing for testing additional sample sites in a watershed to identify potential *E. coli* "hot spots". Although fecal *Enterococcus* and fecal coliform are the correct bacteria indicators for salt or brackish water, the citizen provided Coliscan *E. coli* data may be used to gauge the success of implementation in reducing the amount of fecal bacteria entering the streams. This citizen provided data cannot be used for the purpose of delisting the streams based on observed improvements. Some possible groups to conduct such monitoring in the area were mentioned during the working group sessions, both for hotspot and BMP effectiveness monitoring.

INTEGRATION WITH OTHER WATERSHED PLANS AND PROJECTS

Virginia watershed's come under a variety of individual, though related, water quality programs and activities, many of which have specific geographical boundaries and goals. These include, but are not limited to, the Chesapeake Bay 2000 agreement, the Chesapeake Bay TMDL and Watershed Implementation Plan, TMDLs, Roundtables, Water Quality

Management Plans, Watershed Management Plans, Erosion and Sediment Control regulations, Stormwater Management Program, Source Water Assessment Program, Green Infrastructure Plans, and local comprehensive plans.

The vision of Mathews County's Comprehensive Plan, dated January 18, 2011, mentions the importance of improving water quality through public education and revised zoning, improving water access and recreational opportunities to support growing eco-tourism opportunities, and support for practices that protect and renew natural resources such as aquaculture, boating and working waterfronts that sustain this "Pearl of the Chesapeake".

According to the Middlesex County Comprehensive Plan dated 12/1/2009, the county supports local initiatives to clean up county creeks and tributaries and seek innovative ways to reduce non-point source pollution discharges. Gloucester County's Comprehensive Plan, currently under revision, mentions that "inherent in the quality of life in Gloucester County is its abundant natural environmental assets including an extensive shoreline, broad estuarine rivers, forested areas, rural landscapes and waterfront vistas". Life is linked in all of these counties to the tidal coves, wetlands, and tidal rivers that create a network of passages through the area, making good water quality a priority for optimal enjoyment by both property owners and visitors to the region.

Current on-going watershed projects or programs within Mathews, Middlesex and Gloucester counties to be integrated with the Gwynns Island, Milford Haven, and Piankatank River Watersheds TMDL IP include:

- Mathews, Middlesex, Gloucester County Comprehensive Plans
- Mathews, Middlesex, Gloucester County Septic Tank Pump-Out and Inspection Regulatory Program
- Mathews, Middlesex, Gloucester County Chesapeake Bay Preservation Ordinance
- Gloucester County Green Team
- Middle Peninsula Planning District Commission (MPPDC) Septic System Pump-Out and Repair/Replace Assistance Program
- Department of Environmental Quality No-Discharge Zone Evaluation for the Middle Peninsula
- MMPDC Commission Inventory of Non-Traditional Onsite Sewage Disposal Systems and Impacts on Land Use Patterns, 2009
- Tidewater Soil and Water Conservation District Agricultural Cost Share Programs
- Dragon Run Special Area Management Plan
- Virginia Department of Health Division of Shellfish and Sanitation Surveys, August 2010, June 2006, October 2009
- Virginia Department of Health On-Site Sewage Waiver Cost-Share Program (2012 NFWF funding)
- USACE Chesapeake Bay Oyster Restoration Recovery: Native Oyster Restoration Master Plan for Maryland and Virginia, September 2012
- York River and Small Coastal Basin Roundtable Pet Waste Management Initiative
- VIMS-CCRM Shoreline Situation Reports for Mathews, Middlesex and Gloucester Counties

- Tidewater Oyster Growers Association Gardener Program

POTENTIAL FUNDING SOURCES

Potential funding sources available during implementation were identified during IP development. A brief description of the programs and their requirements is provided in this chapter. Detailed descriptions can be obtained from the Tidewater Soil and Water Conservation District (TSWCD), Virginia Department of Conservation and Recreation (DCR), Virginia Department of Environmental Quality (DEQ), Natural Resources Conservation Service (NRCS), Virginia Cooperative Extension (VCE) and others listed below. It is recommended that participants discuss funding options with experienced personnel at these agencies so as to choose the best option.

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient and sediment loads to surface waters. Eligible recipients include local governments, SWCDs, and non- profit organizations. Grants for nonpoint sources are administered through VADCR. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Requests for Proposals cover non-point source reduction projects.

Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state funding administered through local SWCDs. Locally, the TSWCD administer the program to encourage farmers to use BMPs on their land to better control sediment, nutrient loss, and transportation of pollutants into surface water and groundwater due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Cost-share is typically 75% of the actual cost, not to exceed the various cost-share caps, but there are also some that offer 50% or offer an incentive payment per acre.

Virginia Agricultural Best Management Practices Tax Credit Program

For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, shall be allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. If the amount of the credit exceeds the taxpayer's liability for such a taxable year, the excess may be carried over for credit against income taxes in the next five taxable years. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. This program can be used independently or in conjunction with other cost-share programs on the stakeholder's portion of BMP costs.

Virginia Small Business Environmental Assistance Fund Loan Program

The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs. The equipment must be needed by the small business to

comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a $30 non-refundable application processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

Federal Clean Water Act Section 319 Incremental Funds

USEPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 NPS grants to states. States may use up to 20% of the Section 319 incremental funds to develop NPS TMDLs as well as develop watershed based plans for Section 303(d) listed waters. The balance of funding can be used to implement watershed based plans that have TMDLs. Funds can be used for residential and agricultural BMPs, and for technical and program staff to administer the BMP programs.

Community Development Block Grant Program

The Department of Housing and Urban Development sponsors this program, intended to develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities primarily for persons of low and moderate income. Recipients may initiate activities directed toward neighborhood revitalization, economic development, and provision of improved community facilities and services. Specific activities may include public services, acquisition of real property, relocation and demolition, rehabilitation of structures, and provision of public facilities and improvements, such as new or improved water and sewer facilities.

Conservation Reserve Program (CRP)

Offers are accepted and processed during fixed signup periods that are announced by the Farm Services Agency (FSA). All eligible (cropland) offers are ranked using a national ranking process. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per- acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximize wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration.

Environmental Quality Incentives Program (EQIP)

This program is administered by the NRCS and includes cropland erosion control, nutrient management, forest management, animal waste management, grazing land practices, wildlife

habitat and within this project area a special aquaculture program that offers gear cycling for watermen and oyster bed restoration. For the aquaculture program, there is assistance to replace fouled gear with clean gear and oyster bed restoration includes the payment of $1.50/bushel for placement of new shell on stream bottom to restore oyster habitat. This is a special partnership with VIMS and the Virginia Marine Resources Commission.

Wildlife Habitat Incentives Program (WHIP)

WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia, these plans will be prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance of up to 75% of the total cost of installation (not to exceed $10,000 per applicant) is available for establishing habitat. Applicants will be competitively ranked within the state and certain areas and practices will receive higher ranking based on their value to wildlife. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. For cost-share assistance, USDA pays up to 75% of the cost of installing wildlife practices.

Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. Sign-up is on a continuous basis. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration. Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored. Restoration agreement participants must show proof of ownership. Easement participants must have owned the land for at least one

year and be able to provide clear title.

National Fish and Wildlife Foundation

Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, a full proposal evaluation, and a Board of Directors' decision. An approved pre-proposal is a pre-requisite to the submittal of the full proposal. Grants generally range between $10,000 and $150,000. Projects are funded in the U.S. and any international areas that host migratory wildlife from the U.S. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. Special grant programs are listed and described on the NFWF website (http://www.nfwf.org). If the project does not fall into the criteria of any special grant programs, the proposal may be submitted as a general grant if it falls under the following guidelines: 1) it promotes fish, wildlife and habitat conservation, 2) it involves other conservation and community interests, 3) it leverages available funding, and 4) project outcomes are evaluated.

River Counties Community Foundation

The Foundation will normally make grants from discretionary funds to support new or specific ongoing projects or programs in the areas of cultural, scientific, medical, environmental, social welfare and educational endeavors within Middlesex county. However, grants will not normally be made to individuals, endowments or tax-supported institutions. The Board of Directors may grant exceptions on a case-by-case basis. Grants are made to eligible non-profit organizations that are exempt from federal taxation under 501 (c)(3) of the Internal Revenue Code. Generally, grants will range from $1,000 to $5,000. Grants will be made for operating expenses of a project including equipment, and will not be made for physical plant, day-to-day operating needs of the organization or programs involving religious instruction/activity. The Foundation will strongly consider challenge or matching grants that encourage financial support from individuals and/or other charitable organizations in the project or program.

Middle Peninsula Planning District Commission

Since 2006, the MPPDC has administered several grants through VADCR to provide full financial assistance to low-to-moderate income households in order for them to comply with septic pump-out requirements of the Chesapeake Bay Act. Proof of income is required to establish LMI qualification. In addition to the application, a copy of the first page of the applicant's tax return (Form 1040, 1040A, or 1040EZ), or a copy of Social Security benefits received by applicant. Income for each member living in the household must be included. Proof of ownership of the property where the septic tank is located must be provided (with a property tax receipt, for example). If the property is not owned by the applicant, then a copy of the lease agreement, or a statement indicating that the applicant is responsible for all maintenance of the property. Applications are taken on a first-come, first-served basis until the available grant funding earmarked for pump-outs is spent. An application form and full instructions can be found on the MPPDC website.

Virginia Department of Forestry

Through the US Forest Service Watershed Forestry Program, VDOF has developed a **Virginia**

Trees for Clean Water program designed to improve water quality in the Chesapeake Bay by planting buffers and trees in neighborhoods and communities. A request for proposal was issued on February 26, 2013 for projects in spring/fall 2013. An application form and full instructions can be found on the VDOF website.

Southeast Rural Community Assistance Project, SERCAP

Southeast Rural Community Assistance Project, Inc. (Southeast RCAP) helps small rural towns and communities needing aid in upgrading their water and wastewater systems. They provide training and technical assistance to rural residents for operation and maintenance of those systems, for capacity building and for economic development in their communities. Funding is made available to low-income individuals and communities in the form of grants and loans in order to rehabilitate housing, build water and wastewater infrastructure, assist in small business development, and to finance development projects of small rural governments. Southeast RCAP utilizes volunteers in a variety of programs to conduct these projects, to train community leaders, and to train and recruit additional local volunteers. (www.sercap.org).

The Nature Conservancy

TNC has access to funds for the purchase of conservation easements, fee simple title to property and in some cases can pay for restoration costs for buffer plantings, etc. on those lands for which they or another organization holds an easement.

York River and Small Coastal Basins Roundtable

The watershed roundtable consists of stakeholders who have a vested interest in their communities and are concerned about local water quality. The primary objective of the roundtable is to develop relationships between diverse stakeholders such that they may collaborate, with, learn from and inform each other while effectively acting to address local water issues. Recent projects have involved the constructions of Oyster Reef Balls to improve oyster habitat, the placement of pet waste bag stations in Mathews and Gloucester counties and a pet waste education survey and leash bag holder distribution through area veterinarians in the upper York basin. Funding opportunities are available through the York River and Small Coastal Basin Roundtable to support implementation of this plan. www.yorkroundtable.org

LIST OF ACRONYMS

ARA	Antibiotic Resistance Analysis
BMPs	Best Management Practices
BST	Bacterial Source Tracking
BWG	Business Working Group
CBPA	Chesapeake Bay Preservation Act
CREP	USDA Conservation Reserve Enhancement Program
CRP	USDA Conservation Reserve Program
CWA	Clean Water Act
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
VDH -DSS	Virginia Department of Health, Division of Shellfish and Sanitation
E. coli	Escherichia coli bacteria
EPA	U.S. Environmental Protection Agency
EQIP	USDA Environmental Quality Incentives Program
GWG	Government Working Group IP
TMDL	Implementation Plan
MOU	Memorandum of Understanding
MPN	Most Probable Number
NNPDC	Northern Neck Planning District Commission
NNSWCD	Northern Neck Soil and Water Conservation District
NPS	Nonpoint Source Pollution
RB-1	Septic Tank Pump Out
RB-3	Septic System Repair
RB-4	Septic System Installation/Replacement
RB-4P	Septic System Installation/Replacement with Pump
RB-5	Alternative Waste Treatment System
RRWG	Residential/Recreational Working Group
SC	Steering Committee
SL-6AT	Small Acreage Grazing System
SWCB	State Water Control Board
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
UAA	Use Attainability Analysis
VDACS	Virginia Department of Agriculture and Consumer Services
VDH	Virginia Department of Health
WHIP	USDA Wildlife Habitat Incentives Program
WQ-11	Vegetated Buffers on Cropland
WQMIRA	Virginia's 1997 Water Quality Monitoring, Information and Restoration Act
WQMP	Water Quality Management Plan
WRP	USDA Wetland Reserve Program
YRSCB	York River and Small Coastal Basin Roundtable

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